Exercise	1	2	3	Total
100%	7	5	5	17
Points				

Name:

Stellar Astrophysics

Homework - Lecture 8 - Interaction of Light and Matter

Due date: October 3

1 Bohr's atom model

To demonstrate the relative strength of the electrical and gravitational forces of attraction between the electron and the proton in the Bohr atom, suppose the hydrogen atom were held together solely by the force of gravity. Determine the radius of the ground-state orbit (in units of Åand AU) and the energy of the ground state (in eV).

In case you have problems with this homework, look into Carroll & Ostlie, Section 2.2 and 5.3

2 Heisenberg's uncertainty principle

A white dwarf is a very dense star, with its ions and electrons packed extremely close together. Each electron may be considered to be located within a region of size $\Delta x \simeq 1.5 \times 10^{-10}$ cm. Use Heisenberg's uncertainty principle, $\Delta x\, \Delta p \simeq \bar{h}$, to estimate the minimum speed of the electron. Do you think that the effects of relativity will be important for these stars?

In case you have problems with this homework, look into Carroll & Ostlie, Section 5.4

3 Zeeman effect

The members of a class of stars known as *Ap stars* are distinguished by their strong magnetic fields of a few thousand gauss. The star HD215441 has an unusually strong magnetic field of 34,000 G. Find the frequencies and wavelengths of the three components of the H_α spectral line produced by the normal Zeeman effect for this magnetic field.

In case you have problems with this homework, look into Carroll & Ostlie, Section 5.4